

REMARKS

Applicants and the undersigned reviewed the pending Office Action carefully before preparing this response. In light of the accompanying Request for Continued Examination, this application is believed to be in condition for allowance.

Numerous claims were rejected under 35 U.S.C. § 103 as unpatentable over JP '550 taken together with Hsieh. Applicants appreciate the Examiner's concern, but respectfully disagree. A proposed modification is inappropriate for an obviousness inquiry when the modification renders the prior art reference inoperable for its intended purpose.

On the record, translated JP '550 describes nutrient preservation by not heating at all. (See, page 4, and elsewhere, in the translation, a copy of which is provided herewith as Exhibit A, as it was with the February 17, 2004 Information Disclosure Statement.) Quite to the contrary and as stated by the Examiner, Hsieh describes heating above 50° C and at temperatures considerably higher. As such, Hsieh expressly requires a change in principle under which the JP '550 reference operates. Heating at the Hsieh temperatures would destroy nutrients (e.g., vitamins, etc.) and leave the JP '550 method inoperable for its intended purpose. Such inoperability underscores a lack of motivation to make the proposed modification. Absent motivation, there is no *prima facie* obviousness, and the rejection should be withdrawn.

Impropriety of the cited combination can be considered from an alternate perspective. Another purpose of the JP '550 method is to promote soy protein absorption. To that effect, dry pulverized soy beans are acid-treated to break down or denature the protein component. (See, p. 9 of the JP '550 translation.) On the other hand, Hsieh teaches preserved protein levels by soaking the ground soy bean in hot water without acid treatment (see, col. 3 at lns. 17-36.) In essence, the Examiner is proposing to stop the JP '550 process and divert it in a different direction toward protein preservation. Such a stopping (from dry acid treatment) and diverting (to hot water without acid) is neither

taught nor suggested by JP '550. The rationale used by the Examiner for combination with Hsieh goes directly against a primary purpose of the JP '550 method.

Accordingly, the combination of JP '550 and Hsieh is inappropriate. There is no *prima facie* obviousness. The rejection should be withdrawn, with the subject claims allowed to proceed toward issue.

Numerous dependent claims were rejected in view of the various reference combinations cited. Applicants incorporate herein positions previously presented. Even so, as *prima facie* obviousness is lacking with respect to the independent claims, rejections of the subject dependent claims should also be withdrawn.

This application is now believed to be in condition for allowance. Consistent therewith, favorable action is respectfully requested. The Examiner is invited to contact the undersigned by telephone should any issue remain. Thank you for your help and consideration.

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EXHIBIT A
TRANSLATION

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(54) Process for Treating Soybeans

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SPECIFICATION

1. Title of the Invention

Process for Treating Soybeans

2. Claims

(1) Process for treating soybeans, comprising Step 1 to Step 5 below.

Step 1

Soybeans are pulverized using a pulverizing machine.

Step 2

A suitable quantity of vinegar or a 5% acetic acid aqueous solution is added to the soybeans processed in Step 1 (mixed in occasionally).

Step 3

The above is filtered using a filtration machine.

Step 4

The result is stored for a fixed time in a storage tank and neutralized by adding sodium bicarbonate.

Step 5

A plugger is used to fill the tank and the final product is obtained.

(2) A process for treating soybeans of Claim 1, wherein the vinegar or acetic acid aqueous solution in said Step 2 is 4-5%.

(3) Process for treating soybeans, comprising Step 1 to Step 6 below.

Step 1

Soybeans are pulverized using a pulverizing machine.

Step 2

A suitable quantity of vinegar or a 5% acetic acid aqueous solution is added to the soybeans processed in Step 1 (mixed in occasionally).

Step 3

The above is filtered using a filtration machine.

Step 4

The result is stored for a fixed time in a storage tank and neutralized by adding sodium bicarbonate.

Step 5

The above is filtered using a filtration machine.

Step 6

A plunger is used to fill the tank and the final product is obtained.

3. Detailed Description of the Invention

Industrial Field of the Invention

The present invention relates to a process for treating soybeans by pulverizing soybeans and modifying the odor with acid and without heating, so as to preserve the soybean components that are useful for health, and to make a product that is easy to eat or drink.

Prior Art

Prior Art Process for Employing Soybeans as Food

There are few processes for preparing employing soybeans as food, and these are limited to the preparation of processed foods such as *tofu*, *natto* [fermented soybeans], soy milk, soybean flour, and the boiling of soybeans in the home kitchen.

Recently, it has become popular to soak raw soybeans in vinegar for about 1 week, to prepare vinegared soybeans. However, the proteins do not become completely denatured, and there is residual odor, and the soybeans remain hard even though soaked in vinegar, and the fact of the matter is that effort is required to turn them into food.

In the United States, almost all soybeans are used only for animal feed. However, in recent years, Americans have become aware of the beneficial components in soybeans, and they are starting to use soybeans for food.

It is considered highly significant that the efficient use of soybeans, which are 1/5 the price of rice, provides inexpensive health foods and beverages.

Problems to be Solved by the Invention

The prior art as described above has the following drawbacks.

Raw soybeans and soybean powder have a strong raw odor, and since raw soybeans contain a trypsin inhibitor component that inhibits digestion, they are difficult to turn into foods or beverages, unless they are treated by boiling, steaming, roasting, or the like.

The present invention was conceived of in view of the drawbacks of the prior art, and the object of the present invention is to provide for the following cited below:

1. To preserve the vitamins found in raw soybeans, particularly lecithin which is important to the human body (this component is sensitive to heat, and it is eliminated when heated at 50°C or higher), by not heating at all;
2. To enhance the digestion and absorption of soybeans, and eliminate the soybean odor, by denaturing the soybeans with vinegar;
3. To enhance the degree of denaturing and to shorten the denaturing time through the use of a powder.

Means for Solving These Problems

The present invention aims to eliminate these drawbacks by means of the constitution given below.

That is to say, the first invention is a process for treating soybeans consisting of Step 1 to Step 5 so as to obtain a food product suitable for preventing degenerative diseases.

Step 1

Soybeans are pulverized using a pulverizing machine.

Step 2

A suitable quantity of vinegar or a 5% acetic acid aqueous solution is added to the soybeans processed in Step 1 (mixed in occasionally).

Step 3

The above is filtered using a filtration machine.

Step 4

The result is stored for a fixed time in a storage tank and neutralized by adding sodium bicarbonate.

Step 5

A plugger is used to fill the tank and the final product is obtained.

Next, the second invention is a process for treating soybeans consisting of Step 1 to Step 6 for producing a luxurious drink.

Step 1

Soybeans are pulverized using a pulverizing machine.

Step 2

A suitable quantity of citric acid and sugar or honey and water are added to the soybeans processed in Step 1 (mixed in occasionally).

Step 3

The raw solution is allowed to stand for a certain period of time in a modifying tank.

Step 4

This raw solution and several times its weight of water are added to a mixer and mixed, and after diluting, sodium bicarbonate is added, and then stirred again to neutralize.

Step 5

The above is filtered using a filtration machine.

Step 6

A plugger is used to fill the tank and the final product is obtained.

Operation

This is described along with the advantageous effects of the invention.

Examples of the Invention

The first invention is a process for treating soybeans, employing vinegar or an acetic acid aqueous solution (either one containing 4-5% acetic acid).

The product of the first invention is a food that is advantageous in preventing degenerative diseases.

The steps are as follows:

Step 1

Soybeans are pulverized using a pulverizing machine.

The standards for the powder mesh are as cited in a, b, and c below.

Step 2

A suitable quantity of vinegar or an acetic acid aqueous solution is added to the soybean powder processed in Step 1 (mixed in occasionally).

That is to say, mixing is carried out with a mixer, in a weight ratio of 3.3 vinegar or acetic acid per 1 soybean powder.

Step 3

The above is filtered using a filtration machine.

That is to say, the raw solution that is mixed in Step 2 (in the form of a paste) contains incompletely mixed parts, and in order to purify it, it is passed through a filter press type filtration machine (the press screen is stainless steel and 25 mesh).

Step 4

It is treated in a storage tank.

That is to say, the result is stored for a fixed time in a storage tank and neutralized with sodium bicarbonate (pH hydrogen ion concentration 5.8).

It should be noted that neutralization must be carried out after passage of the necessary denaturation time.

Step 5

A plugger is used to fill the tank and the final product is obtained.

It should be noted that the time required for denaturing is as follows.

Denaturing begins when vinegar is added to soybean powder and mixed by stirring.

- a. Powder 50 mesh (394 microns) 80 min
 - b. Powder 105 mesh (165 microns) 40 min
 - c. Powder 200 mesh (86 microns) 20 min
- (Sieve openings according to the Tyler Co. table)

In this case, the denaturation time of the powder is almost inversely proportional to the grain size.

Incidentally, spherical soybeans (average diameter 78 mm) do not completely denature even if treated for 160 hours, and some odor remains, though it is slight.

Furthermore, it is thought appropriate in selecting the acid concentration so that the vinegar or acetic acid aqueous solution is around 5%, since it becomes difficult to eat or drink if it is sour above a certain point, and if it is too weak, then the denaturation time is prolonged.

The second invention is a process for treating soybeans using citric acid.

The product of the second invention is suited to be a luxurious drink.

The steps are as follows.

Step 1

Soybeans are pulverized using a pulverizing machine.

The standards for the powder mesh are as cited in a, b, and c below.

Step 2

Citric acid is added to the soybean powder processed in Step 1 (mixed in occasionally).

That is to say, using a mixer, mixing is carried out in the following ratio:

Soybean powder	1 (figures represent weight ratios)
Citric acid	0.33
Sugar or honey	0.2
Water	2.5

Step 3

The mixture is allowed to stand for a certain period of time in a modifying tank.

The time required for denaturing is as follows:

- a. Powder 50 mesh (394 microns) 48 hours
 - b. Powder 105 mesh (165 microns) 24 hours
 - c. Powder 200 mesh (86 microns) 12 hours
- (Sieve openings according to the Tyler Co. table)

The denaturation time of the powder is almost inversely proportional to the grain size.

Incidentally, when spherical soybeans are treated with the above-mentioned citric acid solution, they cannot denature (it requires 10 days or more).

Step 4

Mixing is carried out using a mixer.

That is to say, this raw solution and 3 times its weight of water are added together with the raw solution to a mixer and mixed, and diluted. After diluting, sodium bicarbonate is added, and then stirred again to neutralize, to achieve pH (hydrogen ion concentration) on the order of 6.0.

Step 5

The above is filtered using a filtration machine.

That is to say, since there is a small quantity of lees even after Step 4, passing it through an eccentric sieve or an electromagnetic sieve refines it.

Step 6

A plunger is used to fill the tank and the final product is obtained.

It should be noted that it is thought appropriate in selecting the acid concentration so that the citric acid solution is around 15%, since it becomes difficult to eat or drink if it is sour above a certain point, and if it is too weak, then the denaturation time is prolonged.

The constitution of the present invention is described below.

1. The reason why an acid is used is as follows: Plants absorb water from their roots, and the water is broken down into hydrogen and oxygen. Then, the oxygen is released and the remaining hydrogen is used with the carbon dioxide and nitrogen in the air to produce starch and proteins.

The above photosynthesis process is reversed in the human body, where heat is produced as the foundation of life.

The citric acid cycle plays a key role in this process, where starches form pyroracemic acid, which then forms citric acid, and 8 types of acids are formed, and starch, proteins, and oils are formed.

The ingestion of vinegar (containing 4% acetic acid) and citric acid plays an important role in making this cycle run smoothly. In particular, it is important for middle-aged people to ingest these as supplementary foods, since their physical strength decreases, and they have insufficient secretion of stomach acids, as well as insufficient acetic acid, citric acids, and oxalacetic acid in their bodies.

In addition to the above, the Vitamin B1 and B2 groups and enzymes are necessary for the smooth operation of the cycle, but since there are enough enzymes in the body, the ingestion of soybeans (or soybean powder), which are rich in Vitamins B1 and B2, in combination with vinegar and citric acid, provides a significant and rational combination as a health food.

Furthermore, though the protein and calcium in soybeans (or soybean powder) in combination are difficult for the body to absorb, their structures are broken down by vinegar and citric acid, making absorption easier.

2. Why heating is avoided: As mentioned above, lecithin (a phospholipid) is sensitive to heat, and a large portion of its active components are lost at temperatures of 50°C or higher.

Cow's milk contains high levels of lecithin, as do *natto* and *tofu* (which are also affected by heat treatment, sterilization treatment, and chemical treatment).

Moreover, in addition to lecithin, there are vitamins that are sensitive to heat, so being able to prepare food without heat is a highly significant matter.

It should be noted that soybeans also contain high levels of potassium, which serves to remove sodium, one of the factors in degenerative diseases. However, potassium is readily soluble in water, and since it elutes into broths, it has value as a food or drink, without any further treatment.

3. Why powder (soybean flour) is good: The time can be shortened for structural modification of proteins and calcium, and the degree of modification is increased.

Even if vinegar with 2 carbon atoms (containing 4% acetic acid) is added, it takes a week to break down soybeans, and when citric acid with 6 carbon atoms is added, it takes quite a long time (10 days) to break soybeans down. However, if soybeans are pulverized, they can be broken down easily.

When vinegar is added to pulverized soybeans (about 200 mesh), it takes only about 2 hours to break them down, and even if treatment is done with citric acid, the odor disappears almost entirely in about 12 hours.

If powder (soybean flour) is used, treatment can be carried out in a sufficiently short time even with citric acid, which has a weak modifying effect, as mentioned above.

When vinegar is used, there is the characteristic irritating odor of vinegar, so one feels a resistance to eating or drinking. However, citric acid does not present this problem, and when the raw solution is diluted with water, it can of course be used in health food or in a luxurious drink.

Advantageous Effects of the Invention

When used in a food or beverage, the following advantageous effects result:

1. It helps one to recover from fatigue.
2. It soothes stiff shoulders and hip pain.
3. It helps to recover kidney and liver function.
4. It affects hypertension and fatty liver.

(a) Effects on hypertension:

The principal cause of hypertension is excessive intake of salt (NaCl). The potassium in soybeans (soybean flour) serves to remove sodium. (If there is too much sodium in the cells of blood vessels, the cells seek to dilute it by absorbing water, so the blood vessels become thicker, thereby leading to vascular constriction and increased blood pressure.)

Vinegar and citric acid make it easier to burn up harmful lipoperoxides, thus allowing the blood to flow smoothly, and the lecithin in soybeans (soybean flour) dissolves cholesterol deposits on blood vessel walls and expels it from the body. It also works to normalize hypertension.

It should be noted that the choline and unsaturated fatty acid components of lecithin reduce levels of the bad cholesterol, and are a factor serving to increase the good cholesterol (HDL).

(b) Effects on fatty liver:

When an excessive burden is placed on the detoxification capacity of the liver, fats build up in the liver cells, and the metabolic capacity of the liver decreases. That is what fatty liver is. Accordingly, it is important to eat large amounts of food containing choline (a component of lecithin) which has anti-fatty liver effects, and to ingest vinegar and citric acid, which burn fat and decrease it.

That is to say, the acetic acid and other organic acids in vinegar act to reduce the fats and cholesterol that accumulate in the liver.

5. It inhibits bone deterioration.
6. It decelerates old age.
7. Blood pressure is kept normal.
 - (a) Normal levels of cholesterol and neutral fats can be maintained.
 - (b) Sodium, which is a factor in hypertension, is eliminated from the body by the potassium in soybeans.
8. Brain function can be activated

9. Lecithin-modified acetylcholine expands peripheral blood vessels and enhances circulation, for a beautifying effect on the skin and hair.

The above indicates that the poor digestion and absorption of soybeans, which contain abundant nutritional elements, can be treated with acids, and soybeans are pulverized to speed treatment and to achieve complete modification, making it possible to produce foods and beverages from raw soybeans without heating them, so as to contribute to health.

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